

Lake Walcott-Marsh Creek Temperature and E. coli Addendum
Implementation Plan for Agriculture

(1704020906)



Prepared by the Idaho Soil and Water Conservation Commission In
cooperation with the East Cassia Soil and Water Conservation District

June, 2020

Original Plan: Lake Walcott Total Maximum Daily Load (TMDL) Agricultural
Implementation Plan, December 2001. Burley, ID.

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Introduction

The objective of this plan is to address the agricultural component of the bacteria and temperature TMDL addendums for Marsh Creek in the Lake Walcott Subbasin. The Lake Walcott subbasin is located in southern Idaho (Figure 1).

Two reaches of Marsh Creek in the Lake Walcott subbasin were listed on the 1998 §303(d) list for unknown pollutants. The only impairments for these reaches are temperature and *E. coli*. Marsh Creek is a perennial water body listed in Category 5 of the 2010 Integrated Report from its headwaters to its confluence with the Snake River. Marsh Creek discharges to the Snake River, which is also §303(d) listed, and specific reaches of the Snake River have EPA-approved TMDLs for TP. The new TMDLs are necessary to protect and restore the beneficial uses of impaired stream reaches in the Lake Walcott subbasin (DEQ 2013).

The Lake Walcott TMDL addendum does not modify the existing EPA-approved Lake Walcott TMDL (DEQ 2000) in any other way except establishing temperature and *E. coli* TMDLs for Marsh Creek (DEQ 2013).

Project Setting

The Lake Walcott TMDL describes Marsh Creek as originating in the Albion Mountains at 5,800 feet and draining the north side of the Albion Mountains (DEQ 2000, p. 32, 50). The headwaters flow from US Forest Service lands then into a broad alluvial valley that is primarily privately owned. The subbasin drains approximately 75,800 acres (Monek 2009, p. 1)

Once Marsh Creek enters the privately owned land, much of its flow is diverted for agricultural uses (primarily for irrigation). However, agricultural return flow enters the channel from numerous drains and canals along Marsh Creek, providing continuous flow in portions of the stream during certain times of the year. A large diversion dam located on the Skaggs Ranch (i.e., Dewey Pond) is capable of legally drying Marsh Creek entirely during the summer months. Below Dewey Pond, agricultural wastewater returns to Marsh Creek before it enters the Snake River in the Milner Pool area at river mile 659.3 near Parees Island (or Frenchman's Island) on the Snake River.

US Geological Survey records from 1967–1974 for gage station 13082300 (above Dewey Pond) indicate the Marsh Creek drainage produces about 15,000 acre-feet of runoff per year (approximately 21 cubic feet per second [cfs]), of which a third is consumed for agriculture in the Albion Valley upstream of the US Geologic Survey (USGS) gage. Flow from the Skaggs Ranch to within 1–2 miles of the Snake River is infrequent. The final miles of Marsh Creek receive ground water or tail water from fields

during the irrigation season and consequently, this segment of Marsh Creek flows year-round.

A discussion with the Burley Irrigation District (BID) (M. Etcheverry, personal communication with R. Bingham, 2009) indicates that the irrigation season generally runs from April 1 through October 15. During this season, the BID conveys approximately 250 inches of water per day or 5 cubic feet per second (cfs) through Marsh Creek if it is dry. If Marsh Creek is not dry, then BID conveys less than 5 cfs, adjusting for what is in the stream channel. Most water that reaches South 750 East Road prior to discharge into the Snake River is spring water and agricultural irrigation returns.

Additionally, Marsh Creek has an associated Marsh Valley ground water system, sometimes referred to as ground water system 42. It likely exists within the sedimentary valley fill materials (i.e., Qs Aquifer), to which major sources of recharge are downward percolation of precipitation and snowmelt, runoff from surrounding uplands, and leakage from Marsh Creek and its tributaries (Graham and Campbell 1981).

Therefore, the overall hydrology of Marsh Creek is highly dependent on certain sources:

- Snowmelt, and to a much lesser degree, stormwater
- Spring sources
- Irrigation diversions and conveyance

In general, the Marsh Creek drainage is considered a semiarid, snowmelt-driven catchment with two hydrologic cycle primary periods of watering. These primary periods are greatly influenced by the tributaries to Marsh Creek (e.g., Howell Creek and Land Creek):

- The first primary period is a “period of wetting,” when ground water contributes directly to surface streamflows.
- The second primary period is a “period of drying,” when ground water contributes little- to-nothing to surface water flows.

In general, between each primary period is a transition period:

- In the fall, the transition from drying to wetting starts with the infiltration of precipitation and some snowmelt elevating the rate of soil moisture accumulation to exceed evaporation and evapotranspiration. During this transition, and throughout the winter, the soil moisture is maintained.
- In the spring, the wetting period reaches its zenith when the infiltration of snowmelt and precipitation saturate the soil as evidenced by the overland flow of water or runoff. As the soil becomes saturated, hydraulic connectivity occurs, resulting in downslope subsurface flows. Both the runoff and the downslope subsurface flows contribute to increased streamflows at the bottom of the drainage.

As spring turns to summer, runoff subsides despite there being sufficient soil moisture to maintain hydraulic connectivity and continued downslope subsurface flow. At this time, streamflows decline, marking a transition from wetting to drying. As summer progresses, the transition into the drying period becomes complete when evaporation and evapotranspiration deplete the soil moisture until hydraulic connectivity is lost and downslope subsurface flows cease, causing further declines in streamflows. The drying period continues until fall when a transition into the wetting period occurs and the cycle starts over again (IDWR 2004).

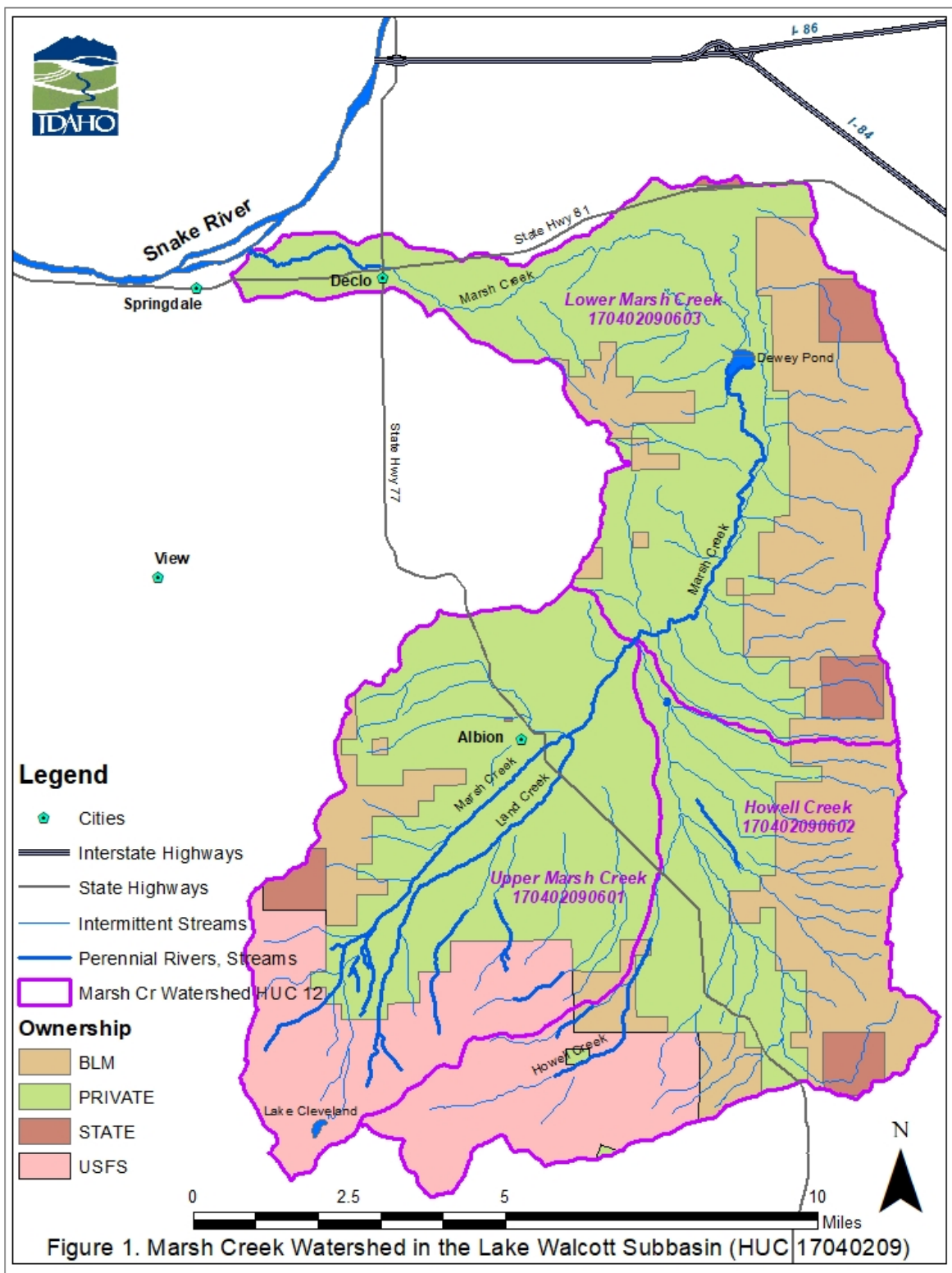


Figure 1. Marsh Creek Watershed Map Showing Surface Ownership

Land Use and Land Ownership

Land use in the Marsh Creek watershed is primarily rangeland. Approximately 24 per cent of land use is cropland, with 2 per cent being used for hay and pasture. The majority of the watershed is privately owned (55 per cent). The public land is distributed as follows: Bureau of Land Management 25 per cent; US Forest Service 17 per cent, and State of Idaho 3 per cent. The small towns of Albion and Declo are the only urban areas in the watershed. The upper watershed has some forest land owned primarily by the US Forest Service. A map of land use/land cover is shown in Figure 2. For a more detailed description of land use, please refer to the original Lake Walcott TMDL and Subbasin Assessment.

Accomplishments

A complete summary of water quality data collected by DEQ or other agencies and analyzed or summarized by DEQ is included in the Lake Walcott 5-year review (DEQ 2012). This document is available at <http://www.deq.idaho.gov/media/840549-lake-walcott-sba-assessment-tmdls-five-year-review-0512.pdf>. The 5-year review also includes a summary of water quality improvement projects that have been implemented since the original TMDL was written in 2000 (DEQ 2013).

Table 1 summarizes specific practices installed within the Marsh Creek Watershed from 2000 through 2018. The majority of these practices were funded with NRCS Farm Bill funds. Money from a 319 grant sponsored by Ducks Unlimited was used to create and restore wetlands in the Lower Marsh Creek portion of the watershed. (This project was referenced in the Lake Walcott 5-year review). This table does not include practices that were implemented by privately funded sources. Ongoing conservation activities include streambank restoration efforts on private property in Upper Marsh Creek to repair flood damage caused by runoff during the winter of 2016-2017. These practices, which include rock drop structures, bank shaping, rock armoring, and willow planting are being partially funded by NRCS.

Table 1: BMPs Installed in Marsh Creek Watershed 2000-2018

HUC 12	Code	Practice Name	Unit	Applied Amount
Howell Creek	314	Brush Management	Ac	1,289
Howell Creek	327	Conservation Cover	Ac	853
Howell Creek	430	Irrigation Water Pipeline	Ft	1,000
Howell Creek	472	Access Control	Ac	853
Howell Creek	600	Terrace	Ft	10,000
Howell Creek	638	Water and Sediment Control Basin	No	7
Howell Creek	645	Upland Wildlife Habitat Management	Ac	1,529
Howell Creek	734	Fish and Wildlife Structure	No	215
Lower Marsh Creek	314	Brush Management	Ac	1,225
Lower Marsh Creek	327	Conservation Cover	Ac	378
Lower Marsh Creek	658	Wetland Creation	Ac	60
Lower Marsh Creek	329B	Residue Management, Mulch Till	Ac	4
Lower Marsh Creek	638	Water and Sediment Control Basin	No	2
Lower Marsh Creek	382	Fence	Ft	1,811
Lower Marsh Creek	430	Irrigation Pipeline	Ft	6,047
Lower Marsh Creek	442	Sprinkler System	Ac	99
Lower Marsh Creek	449	Irrigation Water Management	Ac	196
Lower Marsh Creek	472	Access Control	Ac	378
Lower Marsh Creek	528	Prescribed Grazing	Ac	235
Lower Marsh Creek	533	Pumping Plant	No	2
Lower Marsh Creek	550	Range Planting	Ac	80
Lower Marsh Creek	590	Nutrient Management	Ac	430
Lower Marsh Creek	609	Surface Roughening	Ac	4
Lower Marsh Creek	645	Upland Wildlife Habitat Management	Ac	12,227
Lower Marsh Creek	734	Fish and Wildlife Structure	No	1
Upper Marsh Creek	322	Channel Bank Vegetation	Ac	1
Upper Marsh Creek	327	Conservation Cover	Ac	184
Upper Marsh Creek	328	Conservation Crop Rotation	Ac	46,446
Upper Marsh Creek	329B	Residue Management, Mulch Till	Ac	5,101
Upper Marsh Creek	330	Contour Farming	Ac	4,354
Upper Marsh Creek	344	Residue Management, Seasonal	Ac	4,278
Upper Marsh Creek	378	Pond	No	3
Upper Marsh Creek	382	Fence	Ft	1,110
Upper Marsh Creek	449	Irrigation Water Management	Ac	59
Upper Marsh Creek	472	Access Control	Ac	184
Upper Marsh Creek	512	Forage and Biomass Planting	Ac	59
Upper Marsh Creek	528A	Prescribed Grazing	Ac	218
Upper Marsh Creek	580	Streambank and Shoreline Protection	Ft	70
Upper Marsh Creek	584	Channel Bed Stabilization	Ft	50
Upper Marsh Creek	590	Nutrient Management	Ac	2,918

Upper Marsh Creek	595	Pest Management Conservation System	Ac	423
Upper Marsh Creek	600	Terrace	Ft	106,080
Upper Marsh Creek	609	Surface Roughening	Ac	3,312
Upper Marsh Creek	638	Water and Sediment Control Basin	No	44
Upper Marsh Creek	644	Wetland Wildlife Habitat Management	Ac	5
Upper Marsh Creek	645	Upland Wildlife Habitat Management	Ac	3,126
Upper Marsh Creek	659	Wetland Enhancement	Ac	5

Resource Concerns

Two reaches of Marsh Creek in the Lake Walcott subbasin were listed on the 1998 §303(d) list for unknown pollutants. DEQ determined that the only impairments requiring a TMDL for these reaches are temperature and *E. coli* (DEQ 2013). Sediment (as Total Suspended Solids, or TSS) was mentioned as a possible resource concern that merits continued monitoring.

Temperature

For the Marsh Creek temperature TMDL, DEQ utilized a potential natural vegetation (PNV) approach. This approach is explained in detail in the Lake Walcott TMDL 2013 Addendum (DEQ 2013). According to DEQ's research, the source of heat to a stream that is most controllable is direct solar radiation. The parameters that affect the amount of solar radiation hitting a stream throughout its length are shade and stream morphology. Riparian vegetation and channel morphology are the factors influencing shade that are most likely to have been influenced by anthropogenic activities and can be most readily corrected and addressed by a TMDL (DEQ 2013).

Existing shade was estimated for Marsh Creek from visual interpretation of aerial photos. Aerial photo interpretations were field verified for accuracy with a Solar Pathfinder during the summer of 2008 at Howell Canyon Creek. A solar Pathfinder is a device that allows one to trace the outline of shade-producing objects on monthly solar path charts. The percentage of the sun's path covered by these objects is the effective shade on the stream at the location where the tracing is made (DEQ 2013).

Figure 5 is a map showing existing shade within the Marsh Creek watershed. To determine PNV shade targets for the Lake Walcott Subbasin streams, effective shade curves developed specifically for southern Idaho were examined. Details of this analyses, plus tables showing shade targets for various types of riparian vegetation at various stream widths can be found in the Lake Walcott TMDL 2013 Addendum (DEQ 2013). Tables showing existing and target solar loads for Marsh Creek can also be found in the Addendum. Based on these tables, DEQ created maps showing the difference between existing shade and target shade (Figure 4) and target shade (Figure 6) for the Marsh Creek watershed. These maps are useful for land managers in prioritizing stream reaches for implementation efforts. They should focus on the areas with the largest differences between existing and target shade.

PNV is equivalent to background solar loading. Table 2 shows total solar loads and

average lack of shade for all three streams within the Marsh Creek watershed. Marsh Creek has the largest excess load. The majority of the excess load seen in Marsh Creek comes from two reservoirs (3 million kWh/day) that were built instream for irrigation, erosion control and wildlife. Outside of those two reservoirs excess load in Marsh Creek would require a 56% reduction (DEQ 2013).

Regarding temperature within the lower reach of Marsh Creek, it should be noted that there are low temperature geothermal resources on and in close proximity to Marsh Creek. Figure 7 is a snippet of an Idaho Geological Survey interactive map of hot springs and geothermal sources within Cassia County and the surrounding area (idahogeology.org). The Idaho Department of Water Resources (IDWR) shows a flowing artesian well adjacent to Marsh Creek that is used for irrigation. The maximum temperature was 145 degrees Fahrenheit (maps.idwr.idaho.gov/map/geothermal). The US Geological Survey (USGS) 1:24000 topographic map also shows this well (USGS Albion, Idaho 7.5 Minute Series Topographic). The influence of geothermal water on the temperature of surface water in Marsh Creek adds a layer of complexity for land managers in efforts to mitigate for excess thermal load.

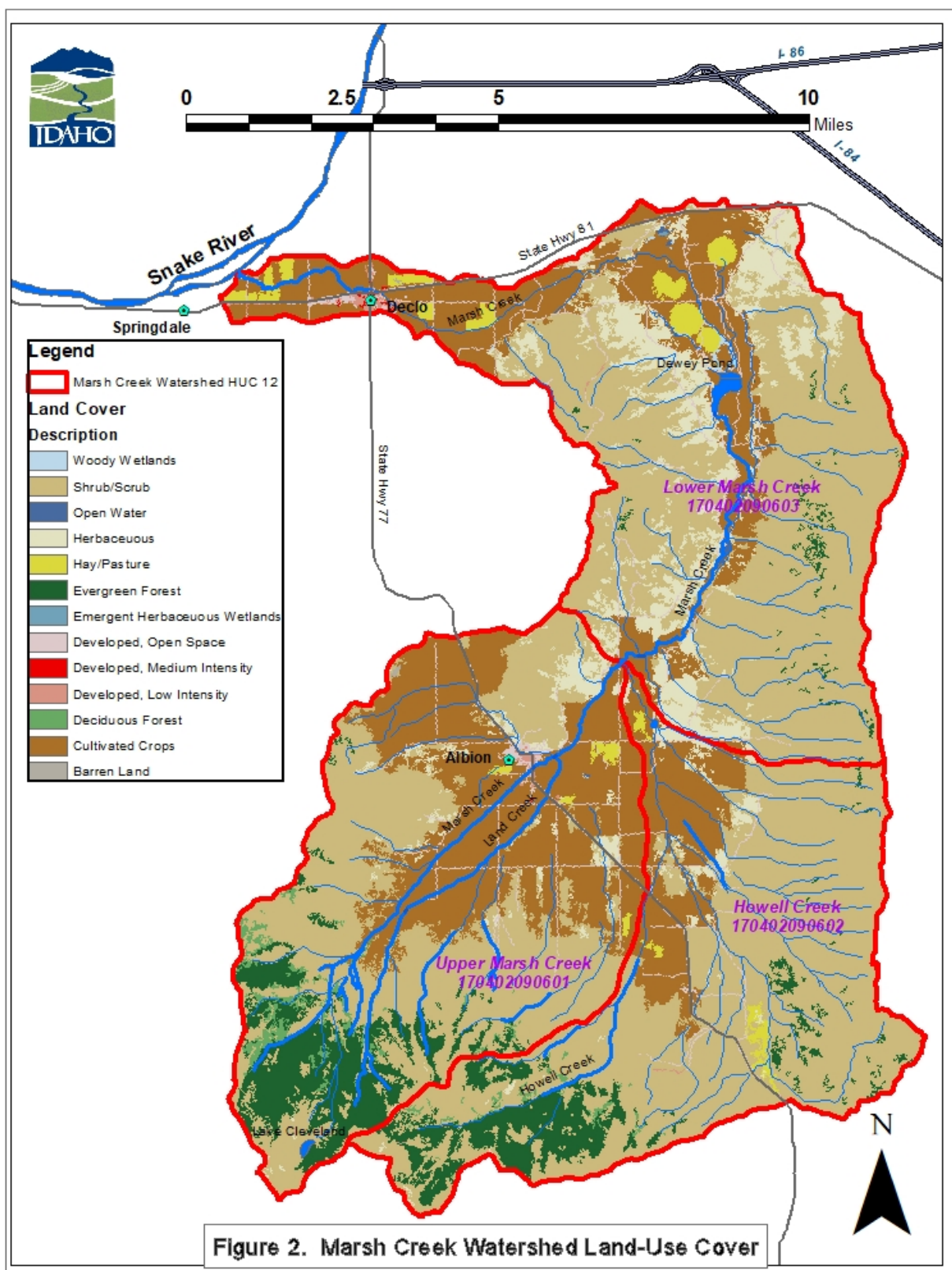
Another factor that affects stream temperatures is the diversion of water for irrigation. DEQ made it clear in the Lake Walcott TMDL Addendum that water diversions are allowed for in state statute, and it is possible for a water body to be 100 per cent allocated. Diversions notwithstanding, local landowners and holders of water rights are encouraged to voluntarily do whatever they can to help instream flow for the purpose of keeping channel water cooler for aquatic life (DEQ, 2013). This will be discussed in the section covering treatment options.

Table 2. Total solar loads and average lack of shade for all waters. (DEQ 2013)

Water Body	Total Existing Load	Total Target Load	Excess Load (Necessary % reduction)	Average Lack of Shade (%) ^a
	(kWh/day)			
Marsh Creek	4,800,000	850,000 (17%)	4,000,000 (83%)	-30
Howell Creek	290,000	160,000 (55%)	130,000 (45%)	-25
Land Creek	120,000	46,000 (34%)	79,000 (66%)	-27

Note: Due to rounding, loads may not sum across columns as expected.

^a Excess load does not equal average lack of shade. The average lack of shade indicates the estimated percent of shade lacking on the stream



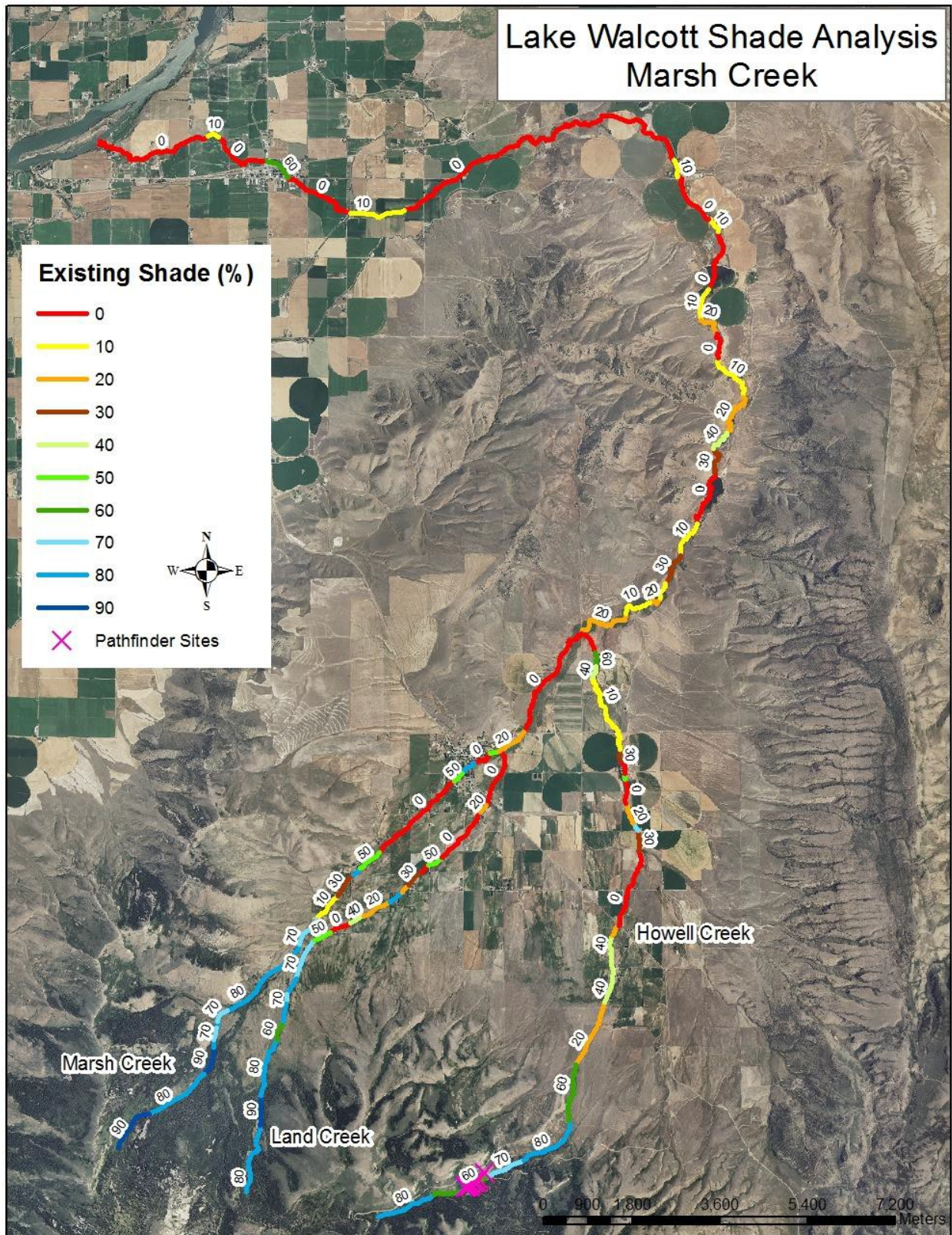


Figure 3. Marsh Creek existing shade (DEQ 2013).

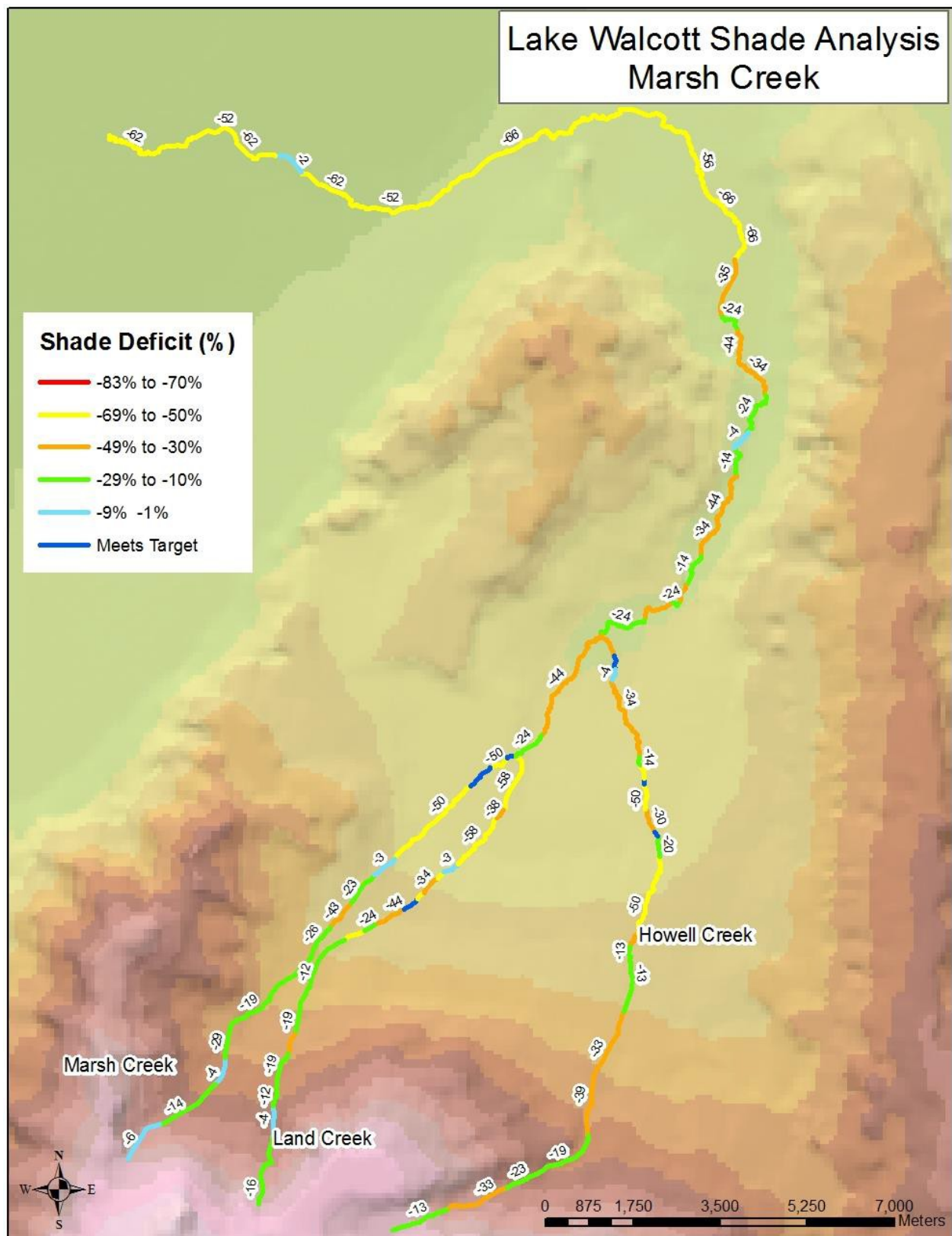


Figure 4: Difference between existing shade and target shade (IDEQ 2013).

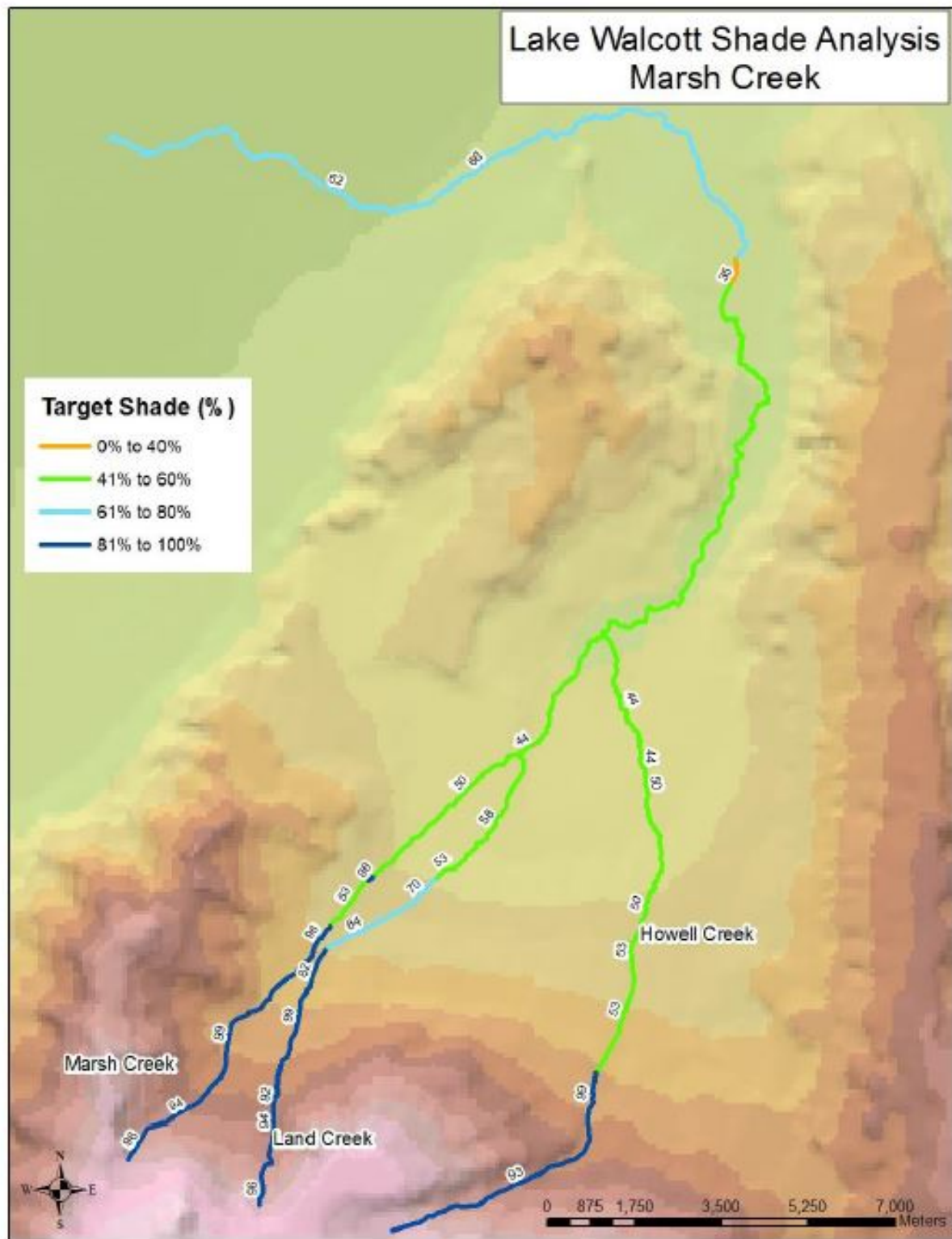


Figure 5. Map showing target shade (IDEQ 2013).

Interactive Map

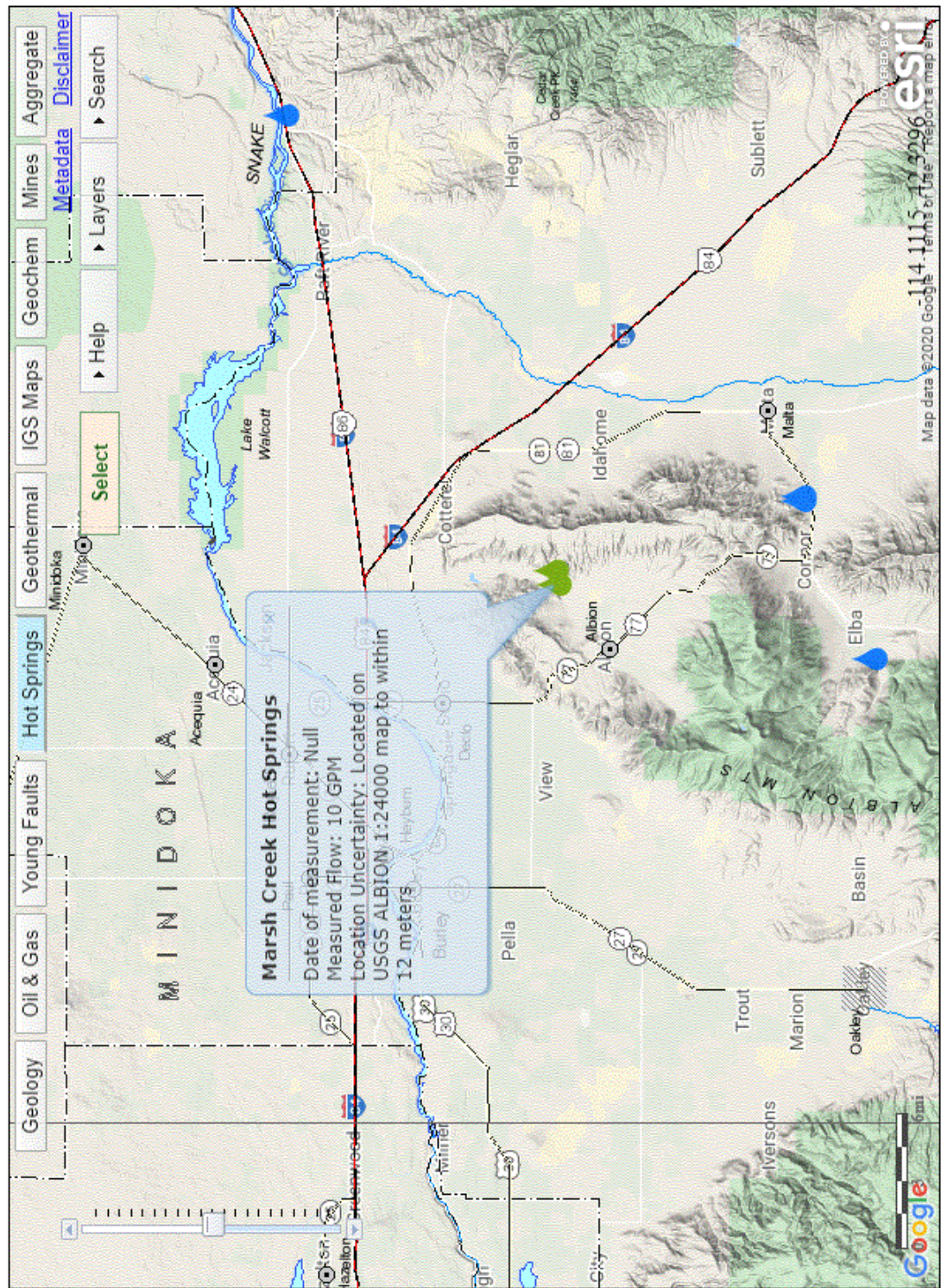


Figure 6. Map showing Marsh Creek Hot Springs
 idahogeology.org/webmap?show=geothermalwells

Bacteria

Based on water quality monitoring data available to DEQ [for Marsh Creek], approximately 28.7 per cent of the *E. coli* data exceeded or were equal to the 406 cfu/100 mL instantaneous instream trigger value for conducting additional sampling to calculate a five-sample geometric mean under Idaho's water quality standards. The exceedances (n = 33) had a minimum value of 410.0 cfu/100 mL, an average of 1,040.6 cfu/100 mL, and a maximum of 2,400.0 cfu/100 mL. In general, these exceedances occurred from April through September, at 16.7% per month on average (DEQ 2000).

Because of the exceedance of trigger values, DEQ also collected *E. coli* samples in the 3rd- and 4th-order of Marsh Creek to determine if water quality standards were being violated. Initial *E. coli* samples taken on Marsh Creek violated the secondary contact recreation single sample criterion (576 cfu/100 mL) and triggered the subsequent sampling necessary to calculate a geometric mean concentration. Five *E. coli* bacteria samples were taken every 3 to 7 days over a 30-day period starting on July 19, 2012, through August 2, 2012. Data revealed a geometric mean of 492 cfu/100 mL in AU ID17040209SK003 03 and 210 cfu/100 mL in AU ID17040209SK003 04, thereby necessitating a TMDL (DEQ 2013).

Several existing land uses may be contributing to bacteria loading. Marsh Creek is diverted for irrigation purposes at several locations, and the tailwater re-enters the creek from numerous drains along the channel. Both reaches of Marsh Creek are used by wildlife and domestic livestock. Irrigation tailwater, livestock, wildlife, and septic system drain field influence are the most likely sources of *E. coli* found in Marsh Creek (DEQ 2013).

Sediment

DEQ, in conjunction with the Idaho Soil and Water Conservation Commission (ISWCC), USGS, and Burley Irrigation District (BID) conducted Total Suspended Sediment (TSS) water quality monitoring from 1997 through 2008 (N = 235 samples) at various sites. Combining all site data resulted in the following TSS concentrations:

- Minimum = 0.0 milligrams per liter (mg/L)
- Mean = 21.5 mg/L
- Median = 6.0 mg/L
- Max = 472.0 mg/L

The water quality data also indicate that approximately 9.4% of the TSS samples exceed or are equal to the recommended 50.0 mg/L TSS instream target identified in the Lake Walcott TMDL. That target was advisory in nature and intended to prevent water quality degradation. The exceedances (N = 22 samples) had a minimum value of 51.6 mg/L, an average value of 138.0 mg/L, and a maximum value of 472.0 mg/L (DEQ 2013).

Because the TSS exceedances are less than the recommended 10% threshold level, a TSS TMDL was not written for Marsh Creek. However, DEQ intends to continue

monitoring Marsh Creek for TSS to determine if sediment is impairing beneficial uses. Based on field observations by personnel with DEQ and ISWCC, some reaches along Marsh Creek indicate that some bank erosion is occurring, and some stream channel incision has occurred. Streambank instability may be investigated in the future (DEQ 2013). High runoff resulting from snowmelt of the winter of 2016-2017 caused flooding and stream bank erosion along some reaches of Marsh Creek, particularly above the city of Albion.

Treatment

Temperature

Priority areas for treatment are shown by the maps included in this report, particularly Figure 4, a map showing the difference between existing and target shade. The areas with the largest differences should be considered high priority locations. Elevated temperatures resulting from agricultural land uses can be minimized or mitigated using Best Management Practices (BMPs). Table 4 is a list of BMPs (and NRCS practice code) identified by NRCS (USDA-NRCS, 2016) and their effectiveness for all of the resource concerns of water bodies within the Marsh Creek Watershed. The following practices are the most effective at addressing water quality degradation due to elevated water temperature: Watering Facility (614); Tree/Shrub Establishment (612); Streambank and Shoreline Protection (580); Stream Habitat Improvement and Management (395); Riparian Herbaceous Cover (390); Riparian Forest Buffer (391); Restoration and Management of Declining Habitats (643); Prescribed Grazing (528); Fish Passage (396); and Access Control (472). Some of these BMPs may have the benefit of enabling water to remain in the stream channel during the summer irrigation season.

Bacteria

The bacteria TMDLs calculated by DEQ (DEQ 2013) for Marsh Creek require a 77 per cent reduction in the Albion reach (assessment unit ID17040209SK003_03) and a 46 per cent reduction in the Declo reach (assessment unit ID170040209SK003_04). Bacteria (*E. coli*) from agricultural sources can be reduced or eliminated by implementing BMPs proven to be effective at managing animal production. Some of these practices include grazing management (prescribed grazing), offsite water development, exclusionary fencing (access control), offsite watering facilities, irrigation water management, and others. Table 4 lists BMPs and their NRCS practice codes for practices that address bacteria resources concerns for surface water and ground water (USDS-NRCS, 2016).

Sediment

Even though sediment is not listed as a resource of concern for Marsh Creek and a TMDL was not developed, BMPs to address excessive sediment in surface water are included in Table 4. It is interesting to note that many of the practices that can reduce sediment in surface water also reduce bacteria in surface water.

Monitoring and Evaluation

As projects are implemented, existing shade levels should be documented prior to implementation of practices to verify the PNV aerial photo interpretation of the site. These before values should be compared to shade levels after implementation to determine actual shade increases of each project. This process will help evaluate the approach that was used in developing the temperature TMDL.

Monitoring may also include photo documentation before and after projects are implemented, annual on-site visits, water quality monitoring (depending on available funding), and BMP effectiveness monitoring using the ISWCC publication “Idaho Agricultural Best Management Practices – Field Guide for Evaluating BMP Effectiveness.” This guide can be found at http://nptwaterresources.org/wp-content/uploads/2014/01/bmp_april2013-sml.pdf.

DEQ will continue to monitor the watersheds at least on a 5-year interval using Beneficial Use Reconnaissance Program (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. The East Cassia Soil and Water Conservation District follows the Natural Resources Conservation Service guidelines for BMP life expectancy and monitors BMP installations for the expected life of each practice to ensure proper maintenance of the practices. Typically, when a volunteer approaches the district 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.

All BMPs will be maintained by the landowner for the life of the practice. BMPs 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.

Table 3: Bacteria, sediment, and temperature BMPs for Agriculture and Effect on Resource Concerns

Best Management Practices (BMPs) & NRCS Practice Code	Water Quality Degradation - Excess Pathogens and Chemicals from Manure, Bio-solids or Compost Applications in Surface Water		Water Quality Degradation - Excess Pathogens and Chemicals from Manure, Bio-solids or Compost Applications in Groundwater		Water Quality Degradation - Excessive Sediment in Surface Water		Water Quality Degradation - Elevated Temperature	
	5	0	0	0	2	0	0	0
Vegetated Treatment Area 635	1	0	0	0	3	0	0	0
Wetland Wildlife Habitat Management 644	1	0	0	0	2	0	0	0
Wetland Restoration 657	1	0	0	0	2	0	0	0
Wetland Enhancement 659	1	0	0	0	2	0	0	0
Wetland Creation 658	1	0	0	0	2	0	0	0
Well Decommissioning 351	0	2	2	0	0	0	0	0
Watering Facility 614	1	-1	-1	1	2	1	1	1
Water and Sediment Control Basin 638	0	-1	-1	0	4	-2	-2	-2
Vegetative Barrier 601	1	0	0	0	2	0	0	0
Upland Wildlife Habitat Management 645	0	0	0	0	2	0	0	0
Tree/Shrub Establishment 612	1	1	1	1	3	1	1	1
Terrace 600	2	-1	-1	0	2	0	0	0
Stripcropping 585	1	0	0	0	2	0	0	0
Streambank and Shoreline Protection 580	1	0	0	0	2	1	1	1
Stream Habitat Improvement and Management 395	0	0	0	0	2	2	2	2
Stream Crossing 578	-3	0	0	0	2	0	0	0
Sediment Basin 350	2	-1	-1	0	4	0	0	0
Riparian Herbaceous Cover 390	3	2	2	2	4	2	2	2
Riparian Forest Buffer 391	3	1	1	1	5	1	5	5
Restoration and Management of Declining Habitats 643	0	0	0	0	2	2	2	2

Effects Quantification: Substantial Improvement = 5, Mod to Substantial Improvement = 4, Moderate Improvement = 3, Slight to Mod Improvement = 2, Slight Improvement = 1, Not Applicable / Neutral = 0, Slight Worsening = -1, Slight to Mod Worsening = -2, Moderate Worsening = -3. (USDA-NRCS, 2016)

Table 3: Bacteria, sediment, and temperature BMPs for Agriculture and Effect on Resource Concerns

Best Management Practices (BMPs) & NRCS Practice Code	Water Quality Degradation - Excess Pathogens and Chemicals from Manure, Bio-solids or Compost Applications in Surface Water		Water Quality Degradation - Excess Pathogens and Chemicals from Manure, Bio-solids or Compost Applications in Groundwater		Water Quality Degradation - Excessive Sediment in Surface Water		Water Quality Degradation - Elevated Temperature	
	1	2	3	4	5	6	7	8
Residue and Tillage Management, No-Till/Strip Till/Direct Seed 328	1	1	0	0	4	4	0	0
Prescribed Grazing 528	1	1	1	1	2	2	1	1
Pond 378	-2	-2	0	0	2	2	0	0
Mulching 484	0	0	0	0	2	2	0	0
Lined Waterway or Outlet 468	0	0	0	0	2	2	0	0
Land Reclamation, Landslide Treatment 453	1	1	0	0	4	4	0	0
Irrigation Water Management 449	2	2	2	2	2	2	0	0
Irrigation System, Sprinkler 442	2	2	1	1	1	1	0	0
Irrigation Storage Reservoir 436	0	0	0	0	2	2	0	0
Heavy Use Area Protection 561	2	2	0	0	2	2	0	0
Grade Stabilization Structure 410	0	0	0	0	2	2	0	0
Fish Passage 396	0	0	0	0	0	0	2	2
Filter Strip 393	3	3	1	1	5	5	0	0
Field Border 386	1	1	0	0	2	2	0	0
Diversion 362	1	1	0	0	2	2	0	0
Critical Area Planting 342	0	0	0	0	4	4	0	0
Cover Crop 340	1	1	2	2	2	2	0	0
Contour Farming 330	1	1	0	0	2	2	0	0
Contour Buffer Strips 332	1	1	-1	-1	2	2	0	0

Effects Quantification: Substantial Improvement = 5, Mod to Substantial Improvement = 4, Moderate Improvement = 3, Slight to Mod Improvement = 2, Slight Improvement = 1, Not Applicable / Neutral = 0, Slight Worsening = -1, Slight to Mod Worsening = -2, Moderate Worsening = -3. (USDA-NRCS, 2016)

Table 3: Bacteria, sediment, and temperature BMPs for Agriculture and Effect on Resource Concerns

Best Management Practices (BMPs) & NRCS Practice Code	Water Quality Degradation - Excess Pathogens and Chemicals from Manure, Bio-solids or Compost Applications in Surface Water	Water Quality Degradation - Excess Pathogens and Chemicals from Manure, Bio-solids or Compost Applications in Groundwater	Water Quality Degradation - Excessive Sediment in Surface Water	Water Quality Degradation - Elevated Temperature
Constructed Wetland 656	4	3	5	0
Conservation Crop Rotation 328	1	0	2	0
Conservation Cover 327	1	2	4	0
Anionic Polyacrylamide (PAM) Erosion Control 450	0	0	4	0
Access Control 472	1	1	3	3

Effects Quantification: Substantial Improvement = 5, Mod to Substantial Improvement = 4, Moderate Improvement = 3, Slight to Mod Improvement = 2, Slight Improvement = 1, Not Applicable / Neutral = 0, Slight Worsening = -1, Slight to Mod Worsening = -2, Moderate Worsening = -3. (USDA-NRCS, 2016)

Funding

Financial and technical assistance for installation of BMPs may be needed to ensure success of this implementation plan. The East Cassia Soil and Water Conservation District can assist interested landowners in actively pursuing potential funding sources to implement water quality improvements on private agricultural and grazing lands. The ISWCC and NRCS can provide technical assistance when needed. Many of these programs can be used in combination with each other to implement BMPs. These sources include (but are not limited to):

CWA 319 –These are Environmental Protection Agency funds allocated to 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. <https://deq.idaho.gov/water-quality/grants-loans/nps-319-subgrants/>

Resource Conservation and Rangeland Development Program (RCRDP) –The RCRDP is a low interest loan program administered by the Idaho Soil and Water Conservation Commission (ISWCC) for implementation of agricultural and rangeland best management practices or loans to purchase equipment to increase conservation. Loans can be used in conjunction with other funding sources or grants. <https://swc.idaho.gov/conservation-loans-2>

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. <http://www.nrcs.usda.gov/programs/eqip/>

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 agreement. <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/rcpp/>

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.

<http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/easements/acep/>

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

<http://www.nrcs.usda.gov/programs/cta/>

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.

<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1068389>

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 <https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/>

Conservation Innovation Grants (CIG) –CIG is a voluntary program to stimulate the development and adoption of innovative conservation approaches and technologies for agricultural production.

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/cig/>

State Revolving Loan Funds (SRF) –These funds are administered through the IDEQ.

<https://www.deq.idaho.gov/water-quality/grants-loans/water-system-construction-loans/>

Conservation Stewardship 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.

<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp/>

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. <https://idfg.idaho.gov/conservation/habitat/hip>

Partners 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. <https://www.fws.gov/idaho/articles.cfm?id=149489623>

Idaho Parks and Recreation – The Idaho Parks and Recreation provides a variety of funding programs and grants to government entities in Idaho for the provision of equipment and for the creation and renovations of outdoor recreational facilities. <https://parksandrecreation.idaho.gov/grants-and-funding>

National Fish and Wildlife Foundation – NFWF provides funding on a competitive basis to projects that sustain, restore, and enhance our nation's fish, wildlife, and plants and their habitats. <http://www.nfwf.org/>

Sustainable Agriculture Research and Education Grants – Since 1988, SARE has funded more than 5,000 projects with grants for farmers, ranchers, extension agents and educators, researchers, nonprofits, students, communities, and others. SARE's mission is to advance—to the whole of American agriculture—innovations that improve profitability, stewardship, and quality of life by investing in groundbreaking research and educations. <https://www.westernsare.org/>

Grants.gov – Large database of federal grant opportunities for a wide variety of topics. www.grants.gov

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