September 2016

Update NHD in IDWR Critical Areas – Big Lost SubBasin

COOPERATIVE AGREEMENT NO. G15AC00506

IDAHO DEPARTMENT OF WATER RESOURCES
322 EAST FRONT ST.
P.O. BOX 83720
BOISE, ID 83720

Linda Davis, Idaho NHD Principal Steward
Danielle Favreau, Idaho NHD Tech. Point of Contact
Missy Harris, GIS Analyst

REPORT TO THE UNITED STATES GEOLOGICAL SURVEY

Paul Kimsey
National Hydrography Dataset
U.S. Geological Survey , NGTOC
P.O. Box 25046, MS-510, DFC
Denver, Colorado 80225

Tom Carlson
Geospatial Liaison
U.S. Geological Survey
NW Region
934 Broadway, Suite 98402
Tacoma, WA 98402

Update NHD in IDWR Critical Areas – Big Lost SubBasin

COOPERATIVE AGREEMENT NO. G15AC00506

TABLE OF CONTENTS

Introduction:

In Idaho, water resources management is critical to the State's agriculturally-based economy. Idaho is the second largest water user in the U.S., only behind California, with the majority of water used in agriculture.[i] Idahoans are also heavily dependent on its water for power. Nearly 90% of Idaho's power is hydroelectric with 136 hydroelectric plants generating an annual average of 11 billion kilowatt hours.[ii] Planners and engineers have a difficult task implementing water-related projects without accurate data and need adequate tools for planning and design. In southern Idaho, where agriculture is dominant, the current National Hydrography Dataset (NHD) often does not match the existing hydrography because of changes on the ground since the digital information was created. The expansion of agricultural land led to the construction of canals and the altering of waterways, sometimes creating major changes to the original hydrography. Idaho is within the Pacific Northwest Region (HU 17), and the Great Basin Region (HU 16). Most of Idaho is in the Pacific Northwest Region and this project area falls within this region.

IDWR has updated hydrography within the Big Lost SubBasin in Idaho, using one meter 2015 National Agricultural Imagery Program (NAIP) imagery and local data. With this project, additional input has been solicited from local irrigation companies and water user agencies.

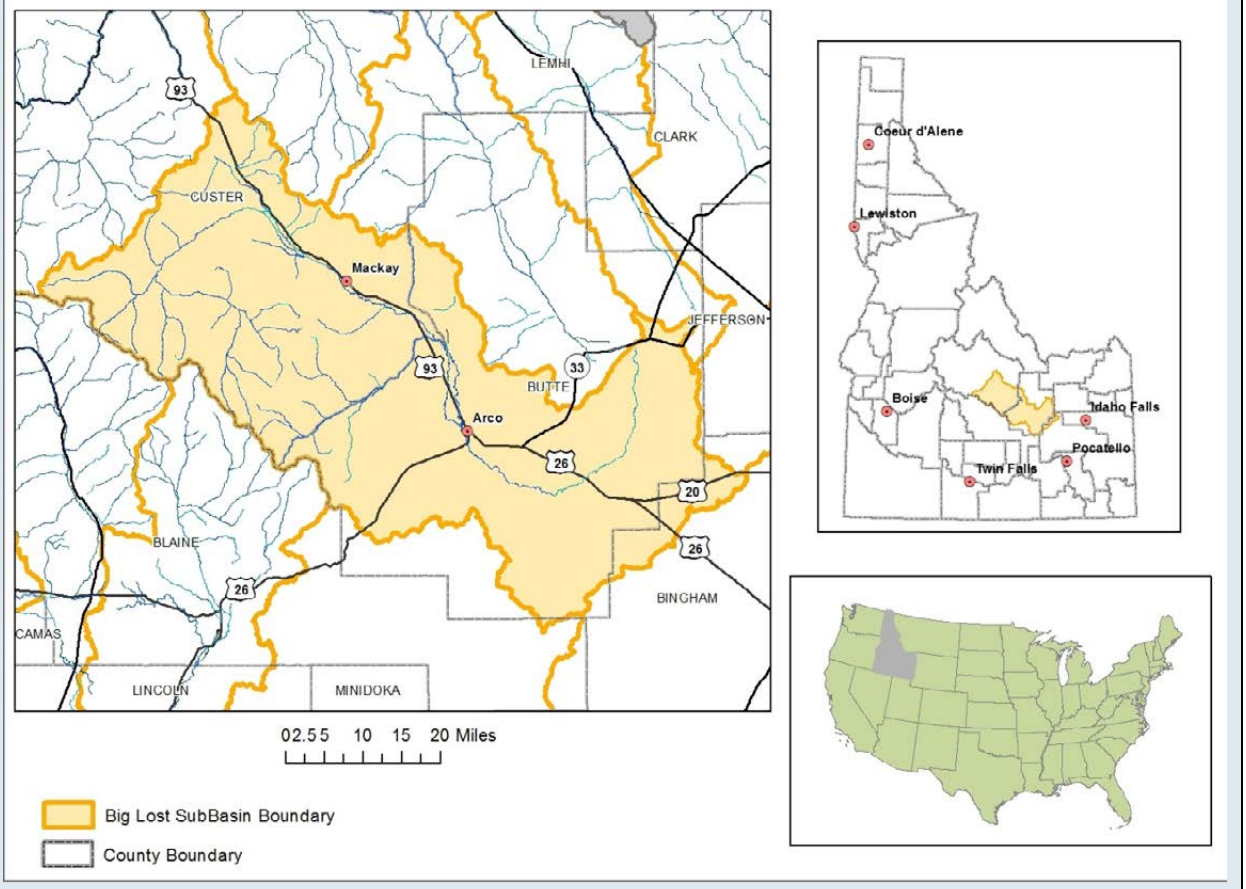
Area of Interest – Big Lost SubBasin:

The Project Area consists of the Big Lost SubBasin 17040218. The Project Area is located in Custer, Butte, and Bingham Counties in Western Idaho. This SubBasin is one of four SubBasins known as the Sinks Drainages because surface waters sink into the Snake River Plain Aquifer. Groundwater flows southwest toward Thousand Springs near Hagerman, Idaho, where the water emerges from springs. Natural discharge from the Snake River Plain Aquifer within the Thousand Spring area, contributes 70 percent of the Snake River flow between the Milner Dam and King Hill.[iii] This flow is critically important as irrigation diversions at Milner Dam can reduce the Snake River flows to zero.

The Big Lost SubBasin is also a basin where Water Right Accounting is used. The Water Rights Accounting Program is a set of computational tools that the watermaster uses to quantify natural flow available, natural flow use, and storage use on a daily, after-the-fact basis. The Water Right Accounting Program computes the natural flow available using stream flow, reservoir, and diversion measurements. Based on the natural flow available, the water rights accounting determines which water rights are in priority. [iv] The annual flow of the Big Lost River is variable and water shortages are common in

Idaho.[v] In 2016, a drought emergency was declared in Custer County and stream flow volumes were forecasted to be 52% to 64% of average. The Big Lost River was found to be flowing at 61% of average in September of 2016. [vi] Therefore, having an accurate representation of hydrography is essential for modeling, analysis and display for water managers, land owners and any agency working with water related projects in the Big Lost SubBasin.

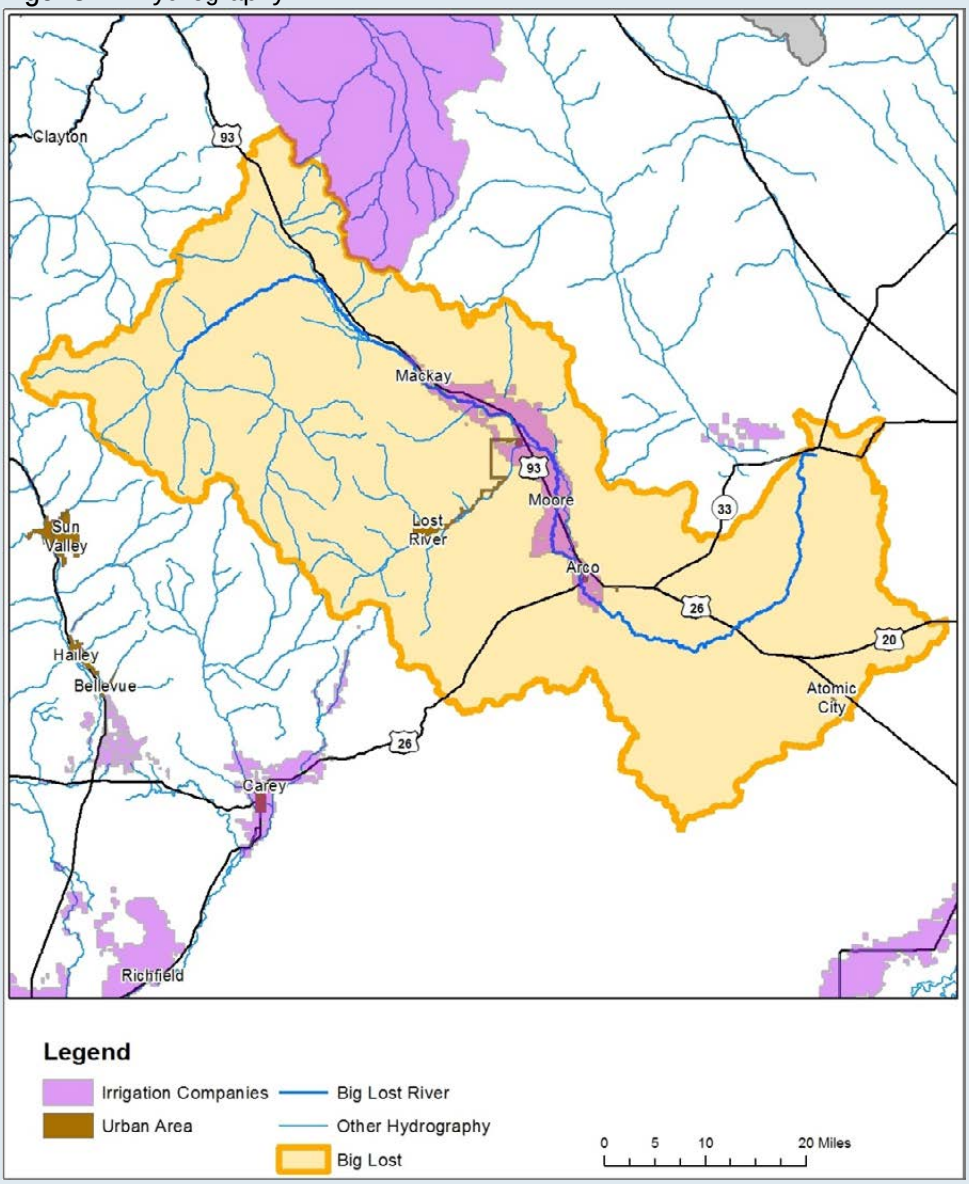
Figure 1: Project Boundary



Most of the population within the Big Lost SubBasin is in the towns of Mackay and Arco. From 2010 Census data; Mackay has a population of 517 and Arco has a population of 995.[vii] This SubBasin has a mix of private, state, and federal lands. The significant land owners in the Project Area are the Bureau of Land Management (21% of the project area) and the United States Forest Service (73% of the project area). About 1.2% of the project area is privately owned.[viii]

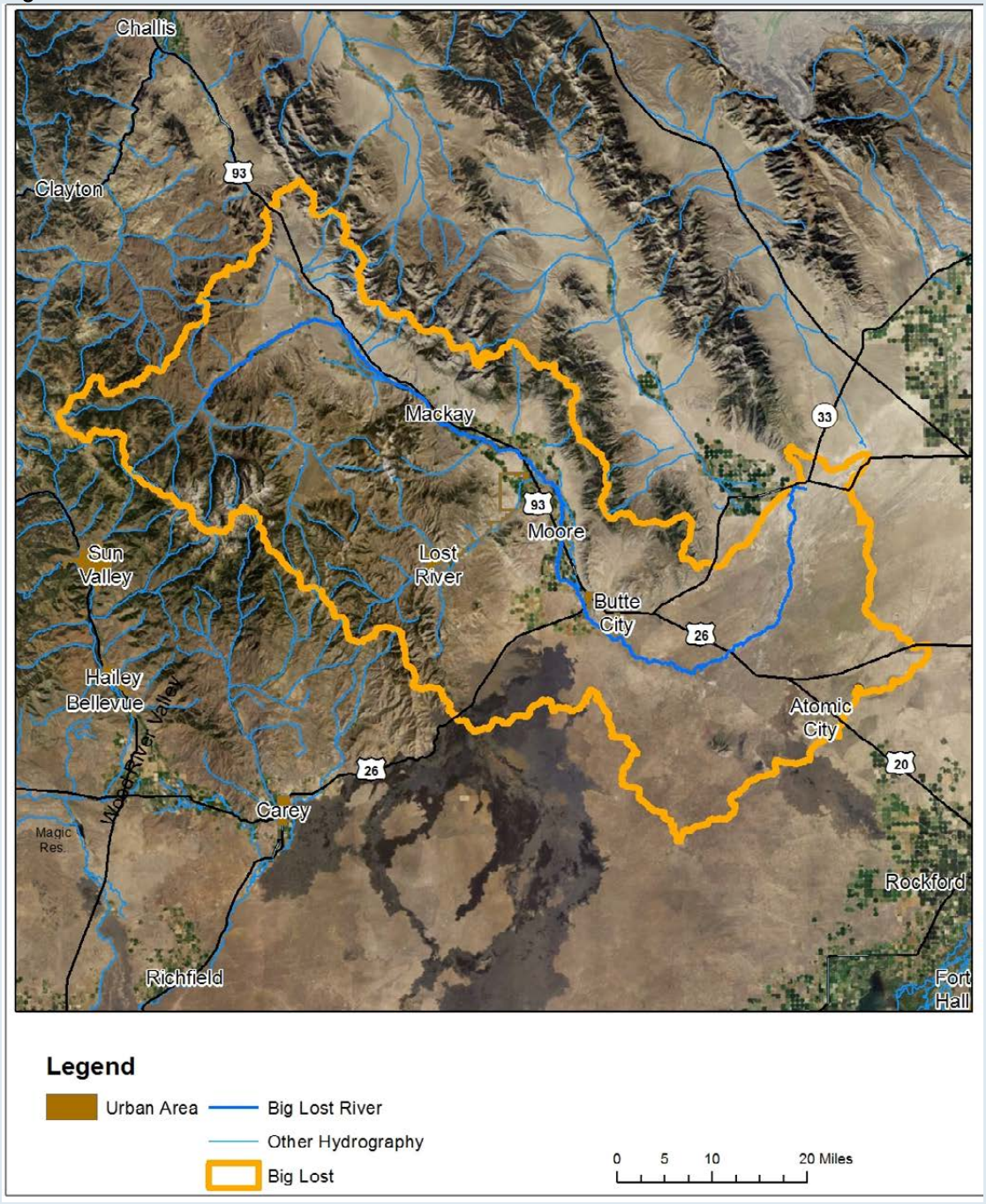
The Big Lost River is the major river in the project area. The Big Lost SubBasin provides a high quality stream fishery for anglers. Species present include brook trout, rainbow trout, cutthroat trout and mountain whitefish.[ix]

Figure 2: Hydrography



The majority of the project area is undeveloped and it dominated by xeric shrubland, especially in the low lying areas. There are some forests in the higher elevations and a few wetlands in the more northern part of the SubBasin. The agricultural areas are primarily along the Big Lost River, which is the primary water feature in the SubBasin. [x] (Figure 3)

Figure 3: General Land Use



There are several organizations with water interests throughout the Big Lost SubBasin. A list of organizations that have been involved in the Water Rights Accounting process and have expressed interest in water in the Big Lost SubBasin is provided in Table 1. IDWR solicited these organizations help to update the NHD hydrography.

Table 1: Big Lost SubBasin Organizations

Bureau of Land Management	Idaho Office of Species Conservation	Natural Resources Conservation Service
National Park Service	Idaho Fish and Game	Water Master – Water District 120
Water Master – Water District 34	Big Lost River Irrigation District	Custer County Soil and Water Conservation District
Lost River Fish Ecology, INC.	United States Forest Service	Idaho Department of Land
Idaho National Laboratory		

Methods:

The Idaho NHD Technical Point of Contact downloaded the Big Lost SubBasin from the NHD stewardship website. NHD data is available at http://nhd.usgs.gov/data.html . The project area consists of Hydrologic unit (HU) 17040218. The existing NHDFlowlines and other NHD features were photo-rectified based 2015 NAIP imagery using the USGS NHD GeoEdit Tools. Areas where questions arose during the photorevision process regarding flow direction, new features, or interactions of features were recorded in order to be sent to local water managers for input.

Next, locally available data was collected from organizations within the project area. Maps of the photorevised hydrography were supplied to the major land managers and interested agencies. These maps were printed at a scale of 1:50,000 with hydrography 2015 NAIP imagery showing flow direction and stream type. These organizations were encouraged to write on the maps indicating areas where the geometry needed to be adjusted and where names needed to be added or corrected. The updated maps were to be used to verify correct placement of hydrography, flow direction, and connectivity.

Maps were sent to 13 confirmed organizations with interests in water (Table 1). The staff at some of these organizations reviewed the updated maps and returned the edited information to IDWR for incorporation into the NHD (Table 2). The USGS NHD GeoEdit Tools were used to incorporate changes for submittal to the USGS for inclusion into the NHD. No additional geometry changes were given by the organizations, but feature names were supplied. The data provided by the local organizations will be used for submittal to GNIS to update names for unnamed NHD Flowlines.

Table 2: **Water Delivery Organizations Who Returned Corrected Maps to IDWR**

BUREAU OF LAND MANAGEMENT	IDAHO OFFICE OF SPECIES CONSERVATION	IDAHO FISH AND GAME
BIG LOST RIVER IRRIGATION DISTRICT		

Results:

Updates Provided to USGS for Incorporation into the NHD

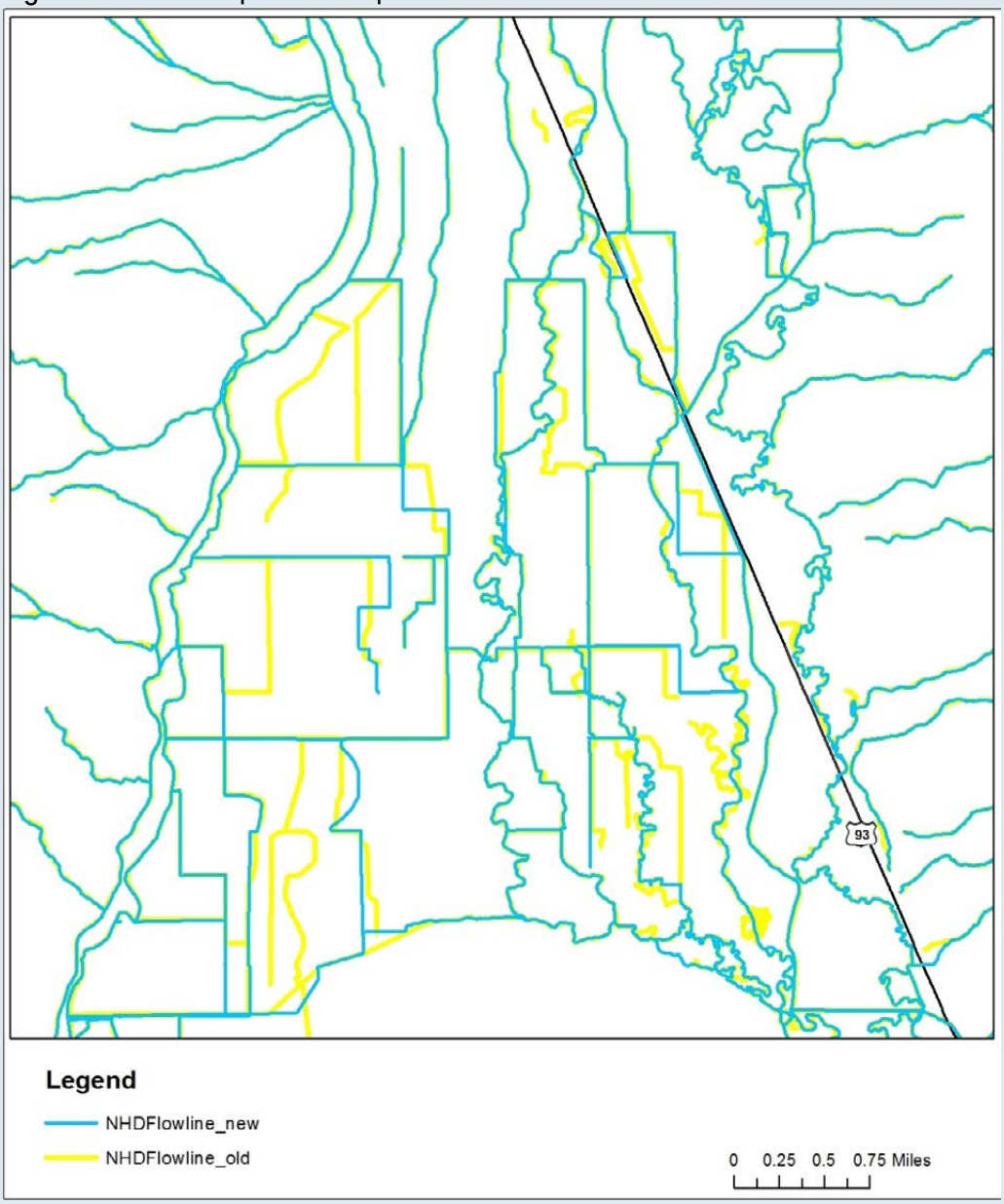
During this review of the Big Lost SubBasin, 15910 NHD Flowlines, 656 Waterbody, and 73 NHD Area edits were inserted, updated, or deleted (Table 3). Updates were submitted to USGS for incorporation into the NHD. See Figure 4 for an example of the updated line work as a result of this project.

Table 3: Number of Edits			
NHDFlowline Edits	**Delete**	**Insert**	**Update**
17040218	2493	1475	11942
NHDWaterbody Edits	**Delete**	**Insert**	**Update**
17040218	394	112	150
NHDArea Edits	**Delete**	**Insert**	**Update**
17040218	20	26	27
TOTAL	**2907**	**1613**	**12119**

Maps provided to Cooperators

IDWR provided maps of the updated NHD to cooperators illustrating the submitted updates in their service area. Many new canals were added, or features had their course corrected or flow direction changed, so it was imperative to get local knowledge to ground check these updates.

Figure 4: Task 1 Update Example



Discussion and Conclusions:

Issues and Challenges

1) *Extensive photorevision was necessary*. Because agricultural activity resulted in a large amount of canal and flowline revision in the project area, the existing NHDFlowlines did not reflect current ground conditions.
2) *Encountered database corrupting errors.* Errors encountered using the QC tool process within the NHD tools where the database became corrupted. These errors showed up as database entries with no attached geometry that corrupted the database. This required sending the database back to USGS as a problem job and checking it back out once USGS was able to rectify the problem.
3) *Time limitations.* Although we provided organizations two months to supply input, some organizations were not able to provide updates in the time allotted. When and if we receive input from any organization in the future, we will incorporate those changes.

Conclusion

Although photorevision is an effective way to update hydrography, input from local sources is critical in accurately depicting connectivity and flow direction. Cooperation from local managers was solicited by providing maps and data products that they found useful in their business processes.

IDWR was able to provide better data for development and monitoring of water storage projects, flood risk reduction and other water rights accounting projects. In working together, all the cooperators have a product that is better than what any one organization could have produced.

Acknowledgements:

Thank you to the Idaho Office of Species Conservation, Idaho Fish and Game, Big Lost River Irrigation District, BLM, who provided feedback on hydrography changes in this SubBasin.

Endnotes:

[i] Idaho Water Resource, University of Idaho publication, CIS 887.
http://www.webpages.uidaho.edu/~karenl/wq/wqu/wqu11.html

[ii] Idaho's Water Energy Resources and Hydroelectric Potential, INL.
http://www.legislature.idaho.gov/sessioninfo/2006/interim/energy0810s_INL.pdf

[iii] Water Resource Inventory 2010, State of Idaho.
http://www.idwr.idaho.gov/waterboard/WaterPlanning/PDFs/2010_Resource-Inventory.pdf p. 34

[iv] Water Rights Accounting. https://www.idwr.idaho.gov/water-data/water-rights-accounting/

[v] Water resources in the big lost river basin, USGS 1970. http://pubs.er.usgs.gov/publication/ofr7093

[vi] Drought Order 2016, Custer County. http://www.idwr.idaho.gov/files/legal/orders/20160914-Drought-Order-2016-Custer-County.pdf

[vii] American Fact Finder, Community Facts.
http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

[viii] GIS analysis of Idaho Land Management layer.
http://www.idwr.idaho.gov/ftp/gisdata/GISScripts/downloadform.asp?path=Spatial/AdministrativeBoundaries/IdahoOwnership&package=idown.pkg

[ix] Idaho Fish Planner, Idaho Department of Fish and Game.
https://fishandgame.idaho.gov/ifwis/fishingplanner/water/?id=2016

[x] GIS Analysis of National Land Cover Database 2011.
http://www.mrlc.gov/