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# Update NHD in IDWR Critical Areas – Lemhi 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



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## 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.<sup>i</sup> 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.<sup>ii</sup> Planners and engineers have a difficult task implementing water-related projects without accurate data and need adequate tools for planning and design. Here, agriculture is dominant and 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 the project area falls within this region.

The Idaho Department of Water Resources (IDWR) has updated hydrography within the Lemhi SubBasin in Idaho, using one meter 2015 National Agriculture Imagery (NAIP) and local data. After edits were incorporated from an initial photorevision process, additional input was solicited from the Technical Advisory Committee (TAC) associated with the Columbia Basin Water Transactions Program (CBWTP). The CBWTP was created to address the regional challenge of keeping water in streams that had frequently gone dry during the peak growing season. The CBWTP also works with landowners and agencies to restore habitat. The TAC has representatives from a variety of agencies.

Event data was also created as part of this project. Events were created from fish screen locations from Idaho Fish and Game, water gage locations from Idaho Power and Idaho Water Engineers, and surface water diversions from Water Right data stored at IDWR.

### Area of Interest - Lemhi SubBasin:

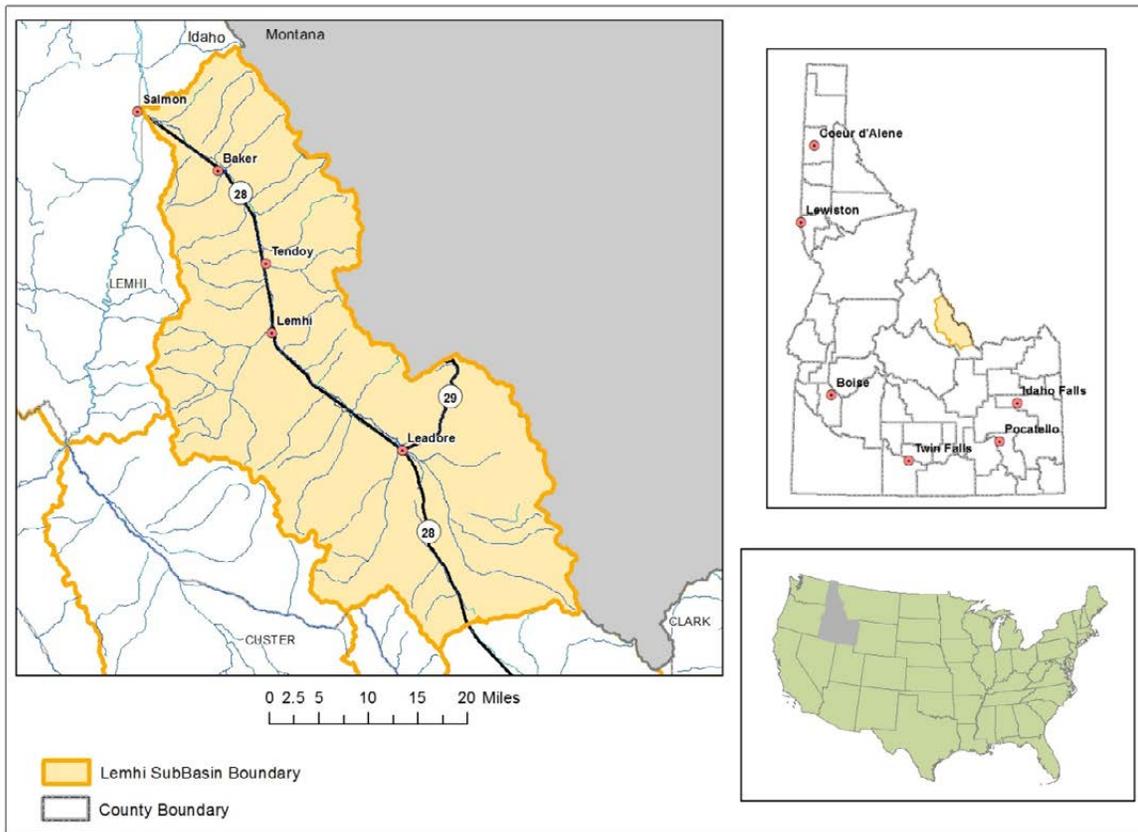
The Project Area consists of the Lemhi SubBasin 17060204 (Figure 1). The Project Area is located in Lemhi County in Western Idaho. The Lemhi SubBasin is part of the Columbia Basin Water Transactions Program – which supports innovative, voluntary, grassroots strategies that improve flows to streams and rivers in the Salmon Basin. The Lemhi and Pahsimeroi SubBasins are targeted in this program. The goal of the CBWTP is to restore water to the streams and rivers, revitalizing the habitats that imperiled salmon, steelhead and native trout need for survival and recovery and to build resilience

in tributaries facing a changing climate, while protecting the local agricultural community.

This Subbasin is also part of the Salmon Basin. The eastern edge of this basin follows the continental divide as well as the state boundary. The Lemhi Subbasin is an area of high ecological value. It provides the majority of the Endangered Species Act (ESA) listed spring Chinook salmon spawning habitat in the Salmon Basin. It also provides habitat to ESA-listed steelhead trout and resident bull trout. Numerous state, federal, county, tribal, and non-profit entities are actively engaged in restoration efforts to address factors limiting the distribution and productivity of these species. These entities include Idaho Fish and Game, Idaho Water Resource Board, Idaho Governor's Office of Species Conservation, Idaho Department of Environmental Quality, Lemhi County Soil and Water Conservation District, US Forest Service, US Bureau of Land Management, US Bureau of Reclamation, Shoshone Bannock Tribes, The Nature Conservancy, Trout Unlimited, and the Lemhi Regional Land Trust.

Having an accurate representation of hydrography is essential for modeling, analysis and display for all the agencies involved in this effort.

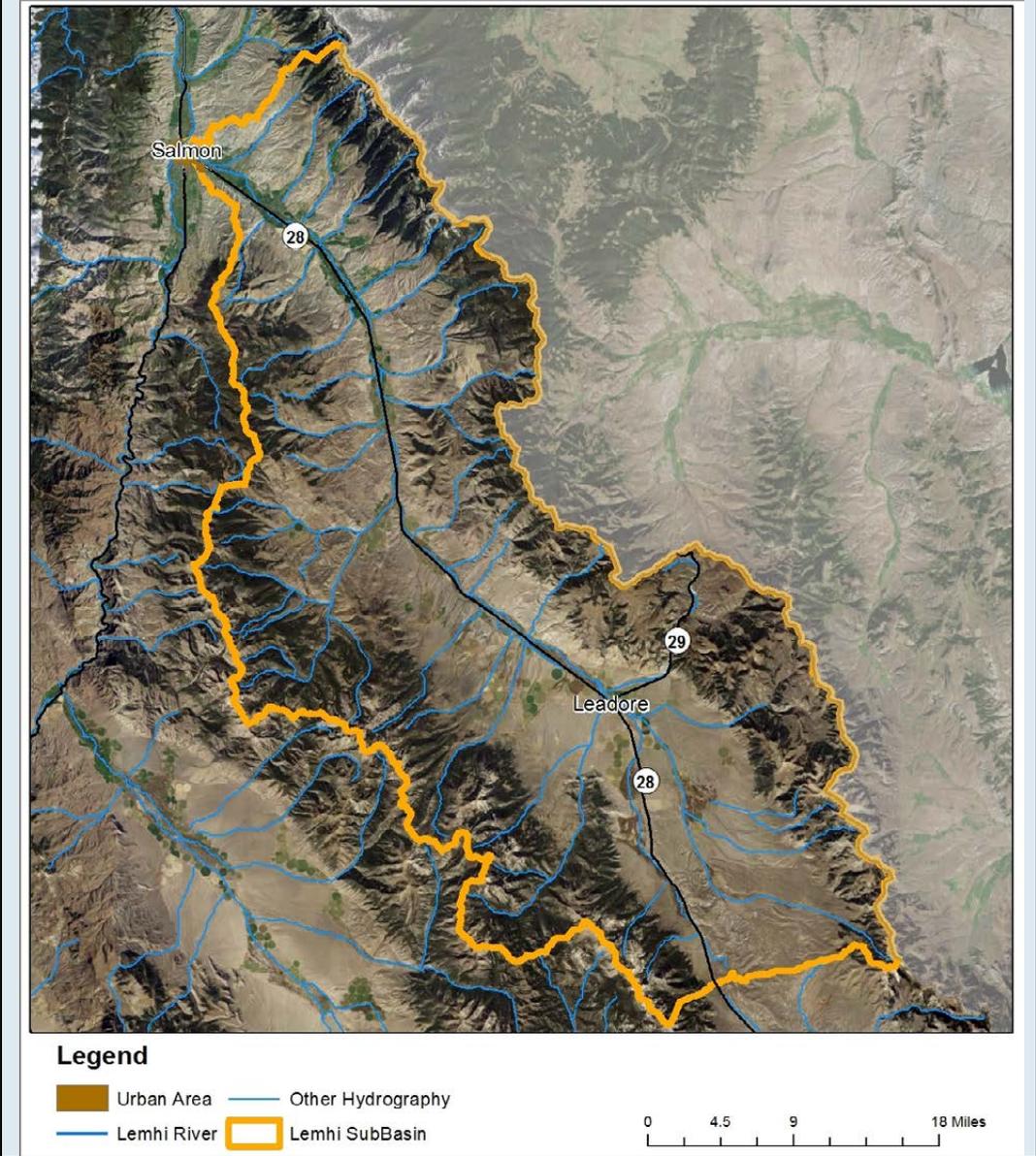
Figure 1: Project Boundary



Most of the population within the SubBasin are from the towns of Salmon and Leadore. From 2010 Census data; Salmon has a population of 3112 and Leadore has a population of 105.<sup>iii</sup>, and a additional 341 people within the SubBasin outside these towns. This HU 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 (78% of the project area). Only a small part of the SubBasin is privately owned (about 0.8%).<sup>iv</sup>

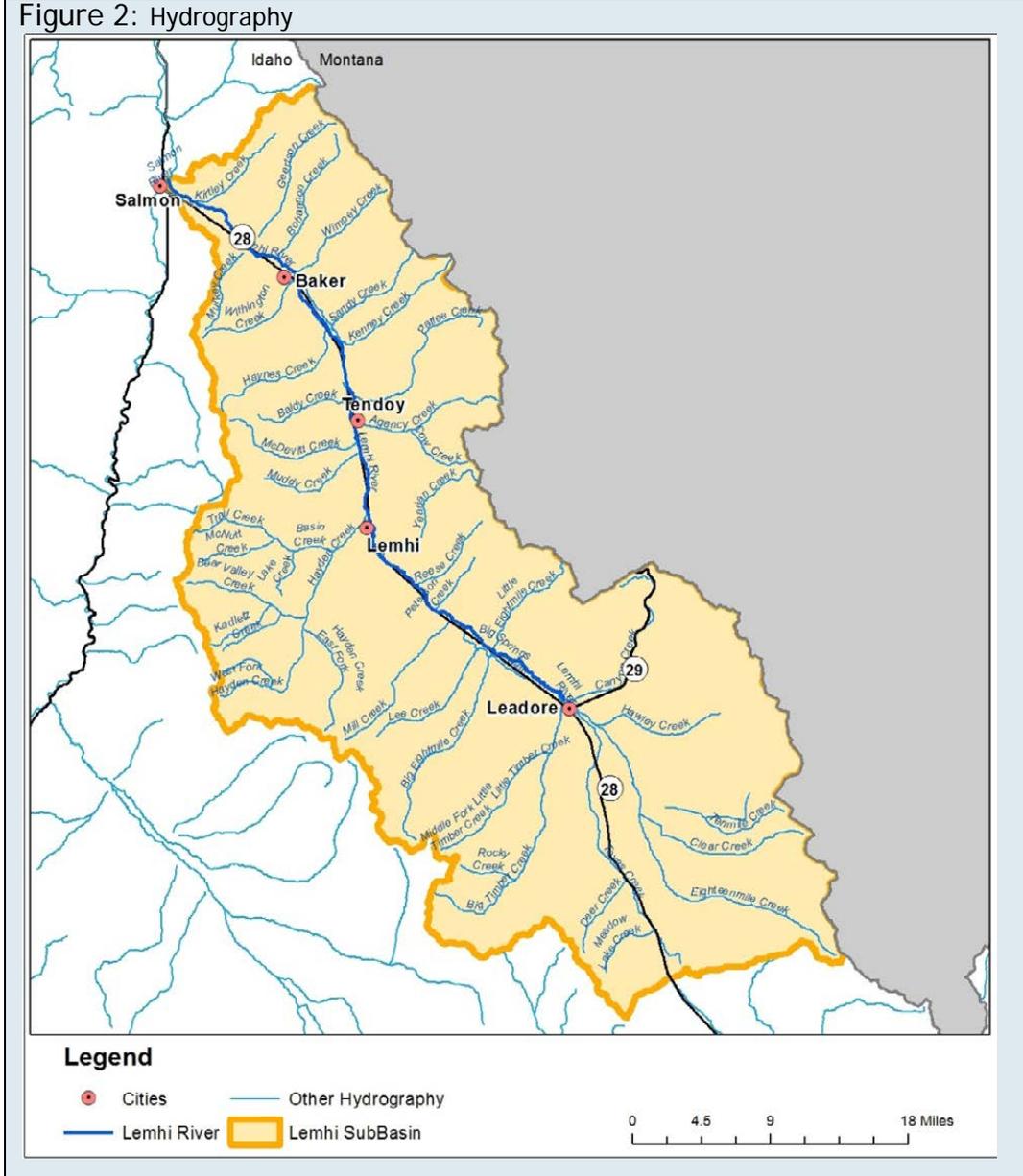
In the majority of the undeveloped project area, xeric shrubland dominates in the low lying areas with forests in the higher elevations.<sup>v</sup> (Figure 3)

Figure 3: General Land Use



The Lemhi River is the major river in the project area.

Figure 2: Hydrography



There are no irrigation companies located within the Lemhi SubBasin, so in order to obtain data from the local water users, IDWR contacted the Technical Advisory Committee (TAC) associated with the Columbia Water Transactions Program and the major land managers. The following agencies attended the TAC: Idaho Department of Water Resources, Idaho Fish and Game, Bureau of Land Management, Idaho Office of Species Conservation – Upper Basin Watershed Program, United States Bureau of

Reclamation, The Nature Conservancy, the Water District 74 Watermaster, and the Lemhi Regional Land Trust.

## Methods:

### NHD - Hydrography:

The Idaho NHD Technical Point of Contact downloaded the appropriate 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) 17060204. The existing NHDFlowlines and other NHD features were photorevised based 2015 NAIP imagery using the USGS NHD GeoEdit Tools. Areas where there were questions regarding flow direction, new features, or interactions of features were recorded in order to be sent to local water managers for input.

Locally available data was collected from by sending map for approval to the Technical Advisory Committee (TAC) associated with the Columbia Water Transactions Program. These maps had the photorevised hydrography overlain on 1 meter resolution National Agriculture Imagery Program (NAIP) imagery flown in 2015. These maps were printed at a 1:50,000 scale, with the updated hydrography showing flow direction, feature name and feature type and were supplied to the cooperators. Also, a mapbook containing maps at 1:24,000 scale was provided. The cooperators 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. The committee reviewed the updated maps and returned the edited information to IDWR for incorporation into the NHD. The USGS NHD GeoEdit Tools were used to incorporate changes for submittal to the USGS for inclusion into the NHD. The data regarding names provided by the local cooperators will be used for submittal to GNIS to update names for currently unnamed NHDFlowlines.

### NHD - Events:

Data was gathered from the following sources (Table 1) and combined into 1 shapefile in ArcMap. The data assembled was important to the TAC because it represented fish barriers, water withdrawals from the stream, and flow gauging stations. Fish screens and dams are the major barriers. Since dams are already present as events in the NHD, fish screen information was gathered. The IDWR Water Right Database was queried for active, named, surface water rights diversions. Gage information was gathered and gages that are not currently in the NHD were selected for inclusion as events.

<b>Table 1: Event Data Sources</b>		
<b>Source</b>		<b>Type of Data</b>
Idaho Fish and Game		Fish Screens
Idaho Power		Water Gages
Idaho Water Engineering		Water Gages
IDWR Water Rights		Major Surface Water Diversions

The point shape file was then run through the USGS HEM tool (v. 10.2) with a snap tolerance of 200 meters. Data points that were farther than 200 meters were checked manually and snapped using the Edit tool in Arc Map. Event data was also reviewed by checking event attribution with stream name, contacting source agency for verification of correct placement for a few questionable locations, and by viewing water right documentation on some water right locations.

**Results:**

NHD Updates Provided to USGS for Incorporation into the NHD

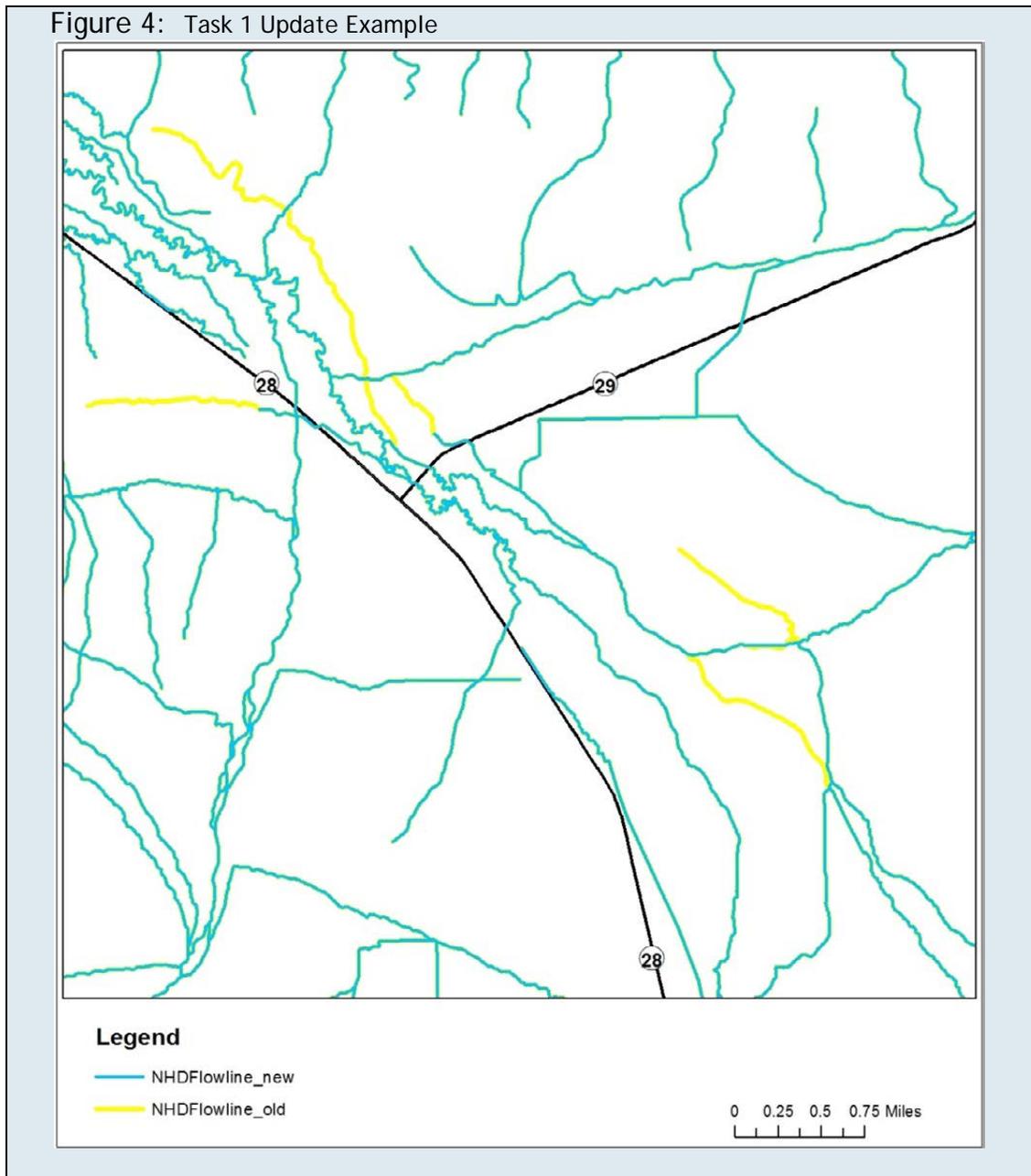
During this review of the Lemhi Subbasin, 2111 NHDFlowlines, 128 Waterbody, and 8 NHD Area edits were inserted, updated, or deleted (Table 2). Updates were submitted to USGS for incorporation into the NHD. See Figure 4 for an example of the updated linework as a result of this project.

<b>Table 2: Number of Edits</b>			
<b>NHDFlowline Edits</b>	<b>Delete</b>	<b>Insert</b>	<b>Update</b>
17060204	74	469	1568
<b>NHDWaterbody Edits</b>	<b>Delete</b>	<b>Insert</b>	<b>Update</b>
17060204	24	35	69
<b>NHDArea Edits</b>	<b>Delete</b>	<b>Insert</b>	<b>Update</b>
17060204	2	2	4
<b>TOTAL</b>	<b>100</b>	<b>506</b>	<b>1641</b>

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, had their course corrected

or their flow direction changed, so it was imperative to get local knowledge to ground check these updates.

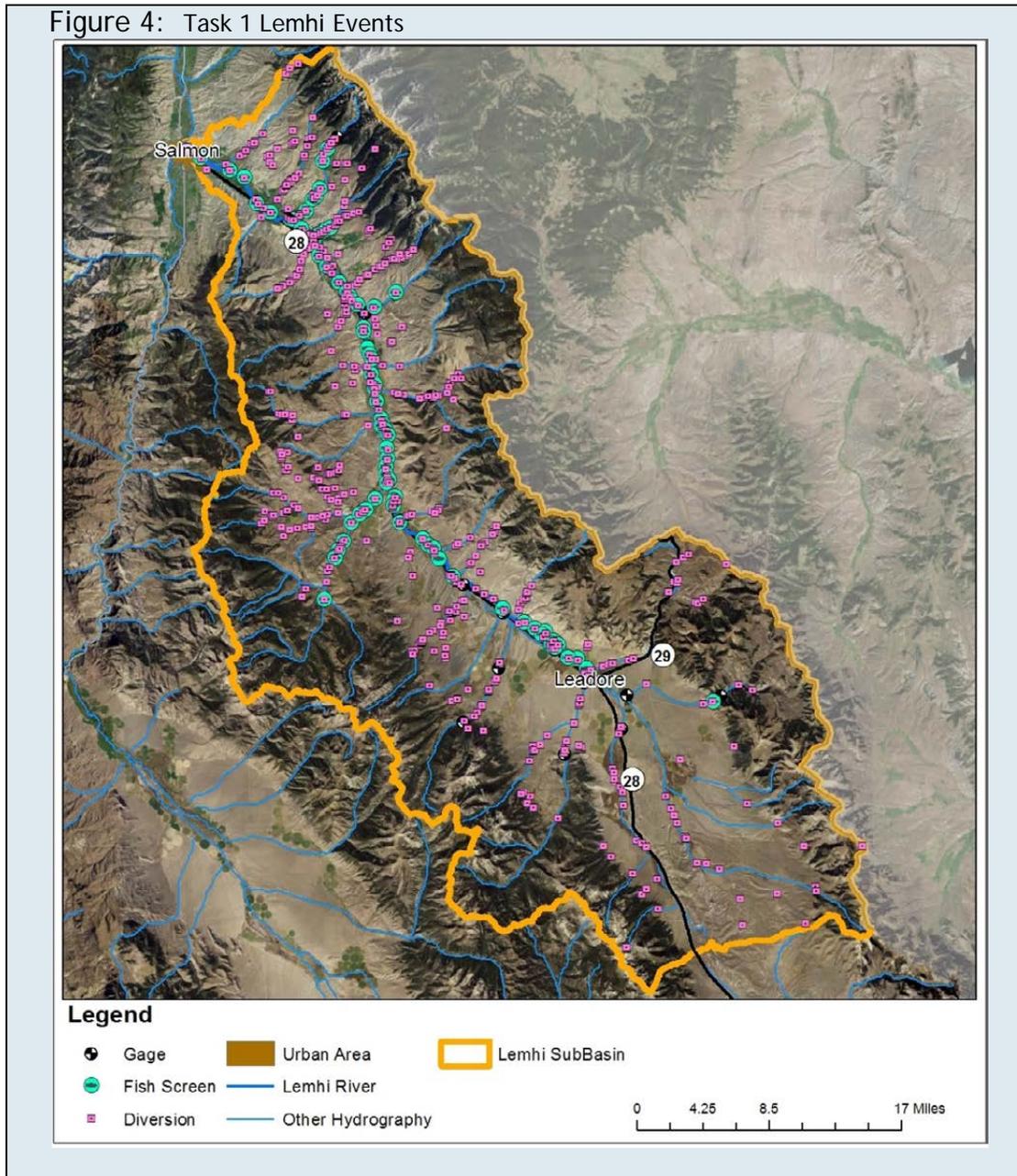


Event Data provided to Cooperators

IDWR provided a Lemhi Events shapefile depicting points representing major surface water diversions, fish screen locations, and water gages to local IDWR managers and Idaho Fish and Game to check for accuracy. (Table 2)

<b>Table 2: Event Data Types</b>		
<b>Type of Data</b>		<b>Count</b>
Fish Screens		96
Water Gages		21
Major Surface Water Diversions		637
<b>TOTAL</b>		<b>754</b>

Figure 4: Task 1 Lemhi Events



### Event Data Posted to Science Base

The event shapefile was uploaded to Science Base, a site where organizations are encouraged to post their network-linked data to the USGS National Hydrography Dataset Linked Data Registry. <sup>vi</sup>

## Discussion and Conclusions:

### Issues and Challenges

- 1) *Extensive photorevision was necessary.* Because of the large amount of agricultural activity in the project area, the existing NHDFlowlines did not reflect current ground conditions.
- 2) *Time limitations.* Due to the time constraint of the project, some local managers did not have enough time provide feedback. When and if we receive edits 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, vertical relationships, and flow direction. Cooperation from local managers was achieved 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 management 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 those who attended the TAC meeting and took the time to check over our maps.

## Endnotes:

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<sup>i</sup> Idaho Water Resource, University of Idaho publication, CIS 887.

<http://www.webpages.uidaho.edu/~karenl/wq/wqu/wqu11.html>

<sup>ii</sup> Idaho's Water Energy Resources and Hydroelectric Potential, INL.

[http://www.legislature.idaho.gov/sessioninfo/2006/interim/energy0810s\\_INL.pdf](http://www.legislature.idaho.gov/sessioninfo/2006/interim/energy0810s_INL.pdf)

<sup>iii</sup> American Fact Finder, Community Facts.

<http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>

<sup>iv</sup> GIS analysis of Idaho Land Management layer.

<http://www.idwr.idaho.gov/ftp/gisdata/GISScripts/downloadform.asp?path=Spatial/AdministrativeBoundaries/IdahoOwnership&package=idown.pkg>

<sup>v</sup> GIS Analysis of National Land Cover Database 2011.

<http://www.mrlc.gov/>

<sup>vi</sup> USGS Science Base, National Hydrography Dataset Linked Data Registry.

<https://www.sciencebase.gov/catalog/item/530d0115e4b08f991722dce3?community=National+Hydrography+Dataset+Linked+Data+Registry>